REMARKS

Applicants appreciate the thorough examination of the present application that is reflected in the Official Action of October 24, 2003. Applicants also appreciate the Examiner's indication that Claims 1-27 and 35-42 are allowed and that Claims 30 and 32-34 would be allowable if rewritten independent form. Frankly, it would be relatively simple to merely cancel rejected Claims 28, 29, 31, 43 and 44 and thereby place the present application in condition for allowance. However, Applicants have studied the cited art relative to rejected Claims 28, 29, 31, 43, and 44 and respectfully submit that these claims are patentable over the cited art. Accordingly, Applicants respectfully request the Examiner to take a second look at the rejections of Claims 28, 29, 31, 43 and 44 to withdraw these rejections, and to allow all of the pending Claims 1-44, for the reasons that will be described below.

A new set of formal drawings is being filed

A new set of formal drawings is being filed concurrently. These formal drawings overcome the draftsperson's objections that were noted in the Notice of Draftsperson's Patent Drawing Review Form PTO-948. Applicants respectfully request entry of these formal drawings.

Claims 28, 29 and 31 are patentable over U.S. Patent 5,311,546 to Paik et al.

Claims 28, 29 and 31 were rejected under 35 USC § 103(a) as being unpatentable over Paik et al.'s Figure 3 and accompanying description. Applicants respectfully submit, however, that there are many significant differences between Claim 28 and Paik et al. and that it would not be obvious to modify Paik et al. to provide these significant differences.

In particular, Claim 28 recites a demodulation system for jointly received first and second signals. Joint demodulation is described extensively in the Background of the Invention section of the present application. In sharp contrast, the quadrature demodulator **58** of Paik et al. Figure 3 is simply not a joint demodulator. Rather, as noted in Paik et al., column 6, lines 18-34:

> The present invention provides an adaptive equalizer that eliminates the phase rotation and phase de-rotation components by locating the equalizer inside of the carrier recovery loop. This is illustrated in general terms in FIG. 2. As with the prior art, modulated data is input to a transmitter **52** via an input terminal **50**. The data is broadcast over a channel **54**, that introduces the

> distortions which cause intersymbol interference in the multilevel modulated data. A communications receiver in accordance with the invention uses a carrier recovery loop **56** that incorporates a demodulator **58**, adaptive equalizer **60**, and carrier recovery circuit **62**. In the illustrated embodiment, 16-QAM data is received, and demodulator **58** is a quadrature demodulator that recovers the real and imaginary complex components from the 16-QAM data.

As clearly described above, the quadrature demodulator **58** operates on unequalized channel data, as shown in Figure 3, and does not constitute a "demodulation system for jointly received first and second signals" as recited in the preamble of Claim 28. Consequently, Paik et al. also does not describe:

> a joint demodulator that is configured to generate an estimated first frequency/first frequency error for the first signal and an estimated second frequency/second frequency error for the second signal;

as recited in Claim 28, because Paik et al.'s quadrature demodulator **16** generates real and imaginary components of 16-QAM data. Neither the 16-QAM data, nor the real and imaginary components are not jointly received first and second signals.

Moreover, the passage cited by the Official Action, i.e., Paik et al., column 7, lines 23-34 states:

> The error signal generator receives the filtered channel data from adaptive filter **70**, <u>determines the error in the filtered data (i.e., the difference between the filtered data and an ideal constellation pattern)</u>, and outputs an error signal indicative thereof for use by the coefficients update calculation circuit. In response to the error signal, updated coefficients are provided to the adaptive filter **70**, so that after a period of time the equalized channel data output from filter **70** will be restored to a condition from which the transmitted data can be recovered by a conventional decoder. (Emphasis added)

This passage clearly recites the determination of errors in the filtered data, i.e., the difference between the filtered data and an ideal constellation pattern, but does not describe or suggest generating an estimated first frequency/first error for the first signal and an estimated second frequency/second frequency error for the second signal, as recited in the above-quoted passage of Claim 28.

The Official Action also notes, at paragraph 2 of page 2, that Paik et al. includes a controller that includes a phase detector (PD) **76**, loop filter (LF) **80** and voltage controlled oscillator (VCO) **82**. However, as noted in Paik et al., column 7, lines 48-52:

> Like error signal generator 72, phase detector 76 also monitors the filtered data from adaptive filter 70. It determines the phase error between the filtered data and the ideal constellation pattern for the modulation scheme used.

Accordingly, as shown in Paik et al.'s Figure 3, the phase detector **76** is responsive to equalized channel data and determines the phase error between the filtered data and the ideal constellation pattern for the modulation scheme used. Thus, the Paik et al's phase detector **76**, loop filter **80** and voltage controlled oscillator **82** do not provide:

> a first long term automatic frequency control that is responsive to the estimated first frequency/first frequency error, wherein the joint demodulator is responsive to the first long term automatic frequency control;

as recited in Claim 28.

The Official Action also concedes that:

> Paik et al. differs from the instant claimed invention that it does not show the steps of separately providing frequency/error estimation and automatic control for each signal.

However, the Official Action states that:

> However, adaptive 70 and controller (PD 76, LF 80, VCO 82) perform the same functions as claimed invention. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to implement Paik et al. to provide the frequency/error estimation and automatic control for each signal for a designed choice.

Applicants respectfully submit, however, that to establish a *prima facie* case of obviousness, three basic criteria must be met. The prior art reference or references when combined must teach or suggest *all* the claim limitations. There must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings, and there must be a reasonable expectation of success of the combination. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found *in the prior art*, not in applicant's disclosure. See MPEP § 2143. As affirmed by the Court of Appeals for the Federal Circuit, to support combining references in a § 103 rejection, evidence of a suggestion, teaching, or motivation to combine must be *clear and particular*, and this requirement is not met by merely offering broad, conclusory statements about

teachings of references. *In re Dembiczak*, 50 USPQ2.d 1614, 1617 (Fed. Cir. 1999). In an even more recent decision, the Court of Appeals for the Federal Circuit has stated that, to support combining or modifying references, there must be particular evidence from the prior art as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed. *In re Kotzab*, 55, USPQ2d 1313, 1317 (Fed. Cir. 2000).

Applicants respectfully submit that there would be no reason for Paik et al. to separately provide frequency and error estimation and automatic control for each signal because the signals in Paik et al. Figure 3 are real and imaginary portions of unequalized channel data, not jointly received first and second signals. Moreover, the rationale provided for the modification, i.e., that the adaptive filter **70** and controller "perform the same functions as claimed invention" is simply not the case as was already described above. In particular, Paik et al.'s controller is used to determine a phase error between the filtered data and the ideal constellation pattern for the modulation scheme being used, and does not provide an automatic frequency controller that is responsive to the estimated first frequency/first frequency error, as recited in Claim 28. Accordingly, the particular evidence that is required by the MPEP and the case law for modifying a reference is simply not present.

Finally, Applicants note that Paik et al. uses two separate control algorithms as noted in the Paik et al. Abstract:

> A method and apparatus are provided for adaptively equalizing data signals in a communications receiver. An unequalized data signal is demodulated. The demodulated data signal is filtered in an adaptive equalizer that initially updates adaptive filter coefficients using error signals derived from a first algorithm. A carrier lock signal is generated when a phase error of a filtered signal output from the adaptive equalizer reaches a threshold value. The adaptive filter coefficients are updated using error signals derived from a second algorithm instead of the first algorithm in response to the carrier lock signal. The first algorithm is a self-recovering equalization algorithm such as the Constant Modulus Algorithm. The second algorithm can be a decision directed algorithm. Carrier phase is recovered without the use of a phase rotator or phase de-rotator, by locating the adaptive equalizer inside of the carrier recovery loop. The invention is particularly adapted for use in the recovery of multilevel amplitude modulated data, such as QAM data.

However, the use of two separate control algorithms would not describe or suggest:

> a first long term automatic frequency control that is responsive to the estimated first frequency/first frequency error, wherein the joint demodulator is responsive to the first long term automatic frequency control; and
>
> a second long term automatic frequency control that is responsive to the estimated second frequency/second frequency error, wherein the joint demodulator is responsive to the second long term automatic frequency control.

as recited in Claim 28. For at least these reasons, Claim 28 is patentable over Paik et al. Claims 29 and 31 are patentable at least per the patentability of Claim 28 from which they depend.

Claims 43 and 44 are patentable over Paik et al. in further view of Bustamante et al.

Claims 43 and 44 were rejected under 35 USC § 103(a) as being unpatentable over Paik et al. in further view of U.S. Patent No. 5,734,639 to Bustamante et al. Regarding Paik et al., the exact same wording is used in paragraph 3 of the Official Action as was used in paragraph 2 of the Official Action with respect to Claim 28. Applicants submit that Claim 43 is patentable over Paik et al. for the same reasons that were described above in connection with Claim 28. Thus, Paik et al. does not describe or suggest the following recitations of Claim 43:

> separately generating an estimate of a first frequency/first frequency error for the downconverted first signal and an estimate of a second frequency/second frequency error in the downconverted second signal;
>
> wherein the separately generating an estimated first frequency/first frequency error for the downconverted first signal and an estimated second frequency/second frequency error for the downconverted second signal is responsive to both the estimated second frequency/second frequency error and the estimated first frequency/first frequency error.

The Official Action concedes that Paik et al. also does not describe or suggest the step of "downconverting the jointly received first and second signals." In order to supply the missing teaching, the Official Action cites Bustamante et al. Figure 1 downconverter **14**. Applicants agree that a downconverter is shown in Bustamante et al. However, the downconverter **14** is used to couple an antenna **13** to a plurality of transceivers **12**. See Bustamante et al., column 3, lines 54-62. Applicants respectfully submit that there is no motivation to combine Bustamante's downconverter **14** into "*Carrier Phase Recovery for an Adaptive Equalizer*" of Paik et al. Moreover, even if combined, the combination would not

suggest that an estimate of a first frequency/first frequency error and an estimate of a second frequency/second frequency error be obtained from the downconverted first signal and the downconverted second signal respectively, as recited in Claim 43. Moreover, there is no suggestion that this separately generated estimate be "responsive to the both the estimated second frequency/second frequency error and estimated first frequency/first frequency error," as recited in Claim 43. Accordingly, even if these diverse references were combined, they would not describe or suggest the recitations of Claim 43.

Claim 44 is patentable at least per the patentability of Claim 43, from which it depends.

Conclusion

Applicants again thank the Examiner for the thorough examination and the indication that almost all of the claims are allowed or allowable. However, based on the analysis above, Applicants respectfully submit that the remaining claims are also in condition for allowance. Accordingly, Applicants respectfully request allowance of all pending Claim 1-44 and passing the application to issue.

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